California's Options for Achieving a 50% Reduction in Residential Lighting Energy Consumption

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Presented at the California Energy Commission on behalf of PG&E

January 15, 2008

Key Lighting Topics

- Enforcement issues with existing standards
- Federal standards for general service lamps
  - Stringency
  - Product scope
  - Loopholes
  - Likely market impacts
- Huffman bill requirements in California
  - How much of the 50% savings will EISA provide?
  - Bounding the range of uncertainty through three scenarios
- Market research findings
- Recommendations

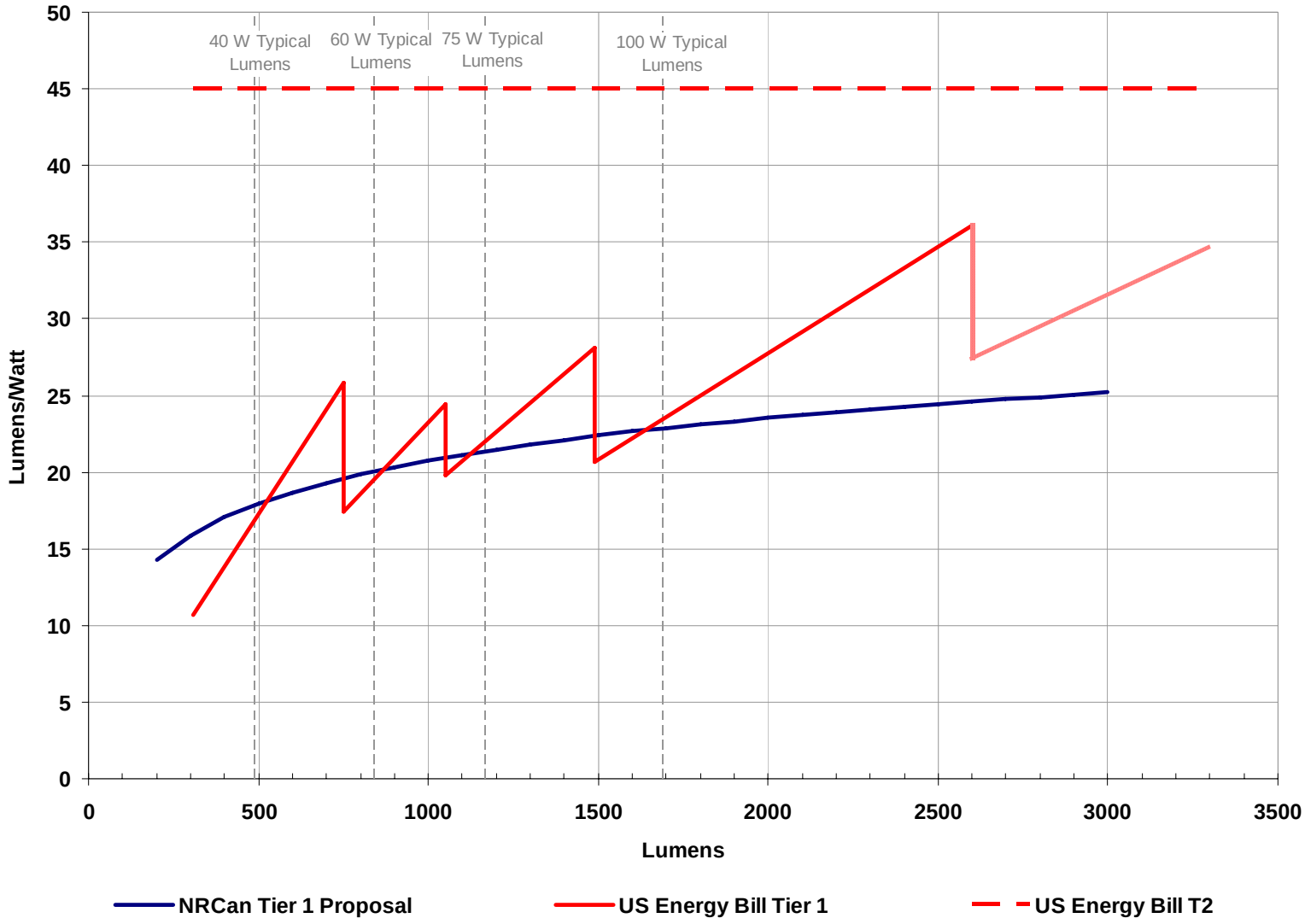
Enforcement

- Most incandescent bulbs on the shelves today in California still do not meet the Tier 2 standards that took effect 1/1/08
- In some cases, major national chain retailers are still selling bulbs that do not meet the *Tier 1* standards that took effect 1/1/06
- No marketing materials in stores to explain the new wattages and urge people to buy on the basis of lumens instead of watts – concern is that many will shift up to higher wattages

Energy Independence and Security Act of 2007 (EISA) Lighting Standards

- General service lamps (Tier 1 and Tier 2)
  - Tier 1 phased in 2012-2014
  - Tier 2 takes effect in 2020 (after Huffman deadline)
  - Key lamp types exempted from standards or subject to later action by DOE if sales double
  - Modified spectrum lamps given less stringent standards with no sales limit
  - Broad pre-emption of action by states other than implementing federal standards early
  - Better FTC labeling encouraged
- Incandescent reflector lamps
- Metal halide lamps

Clear, Frost & Soft White Standards



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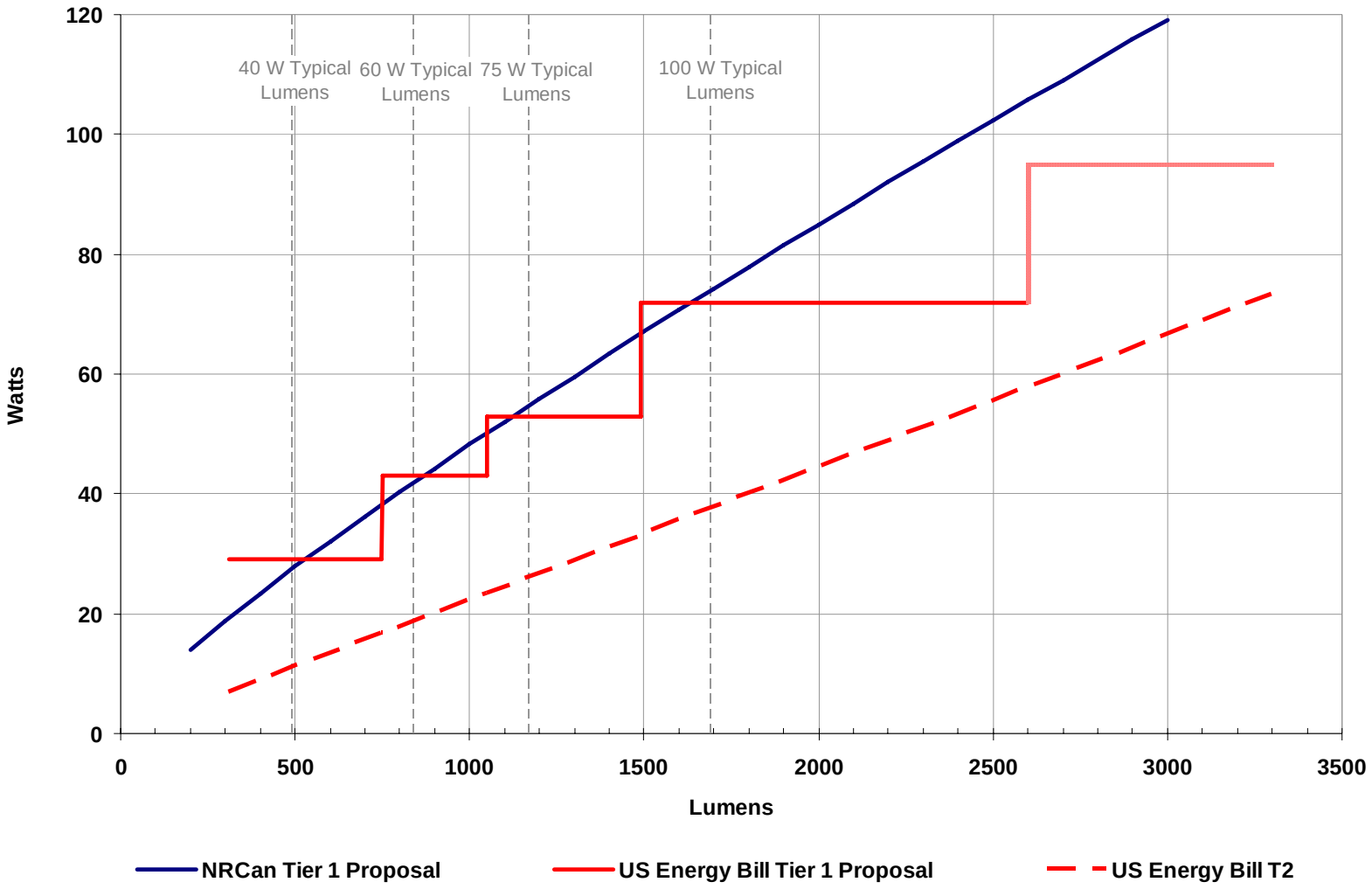
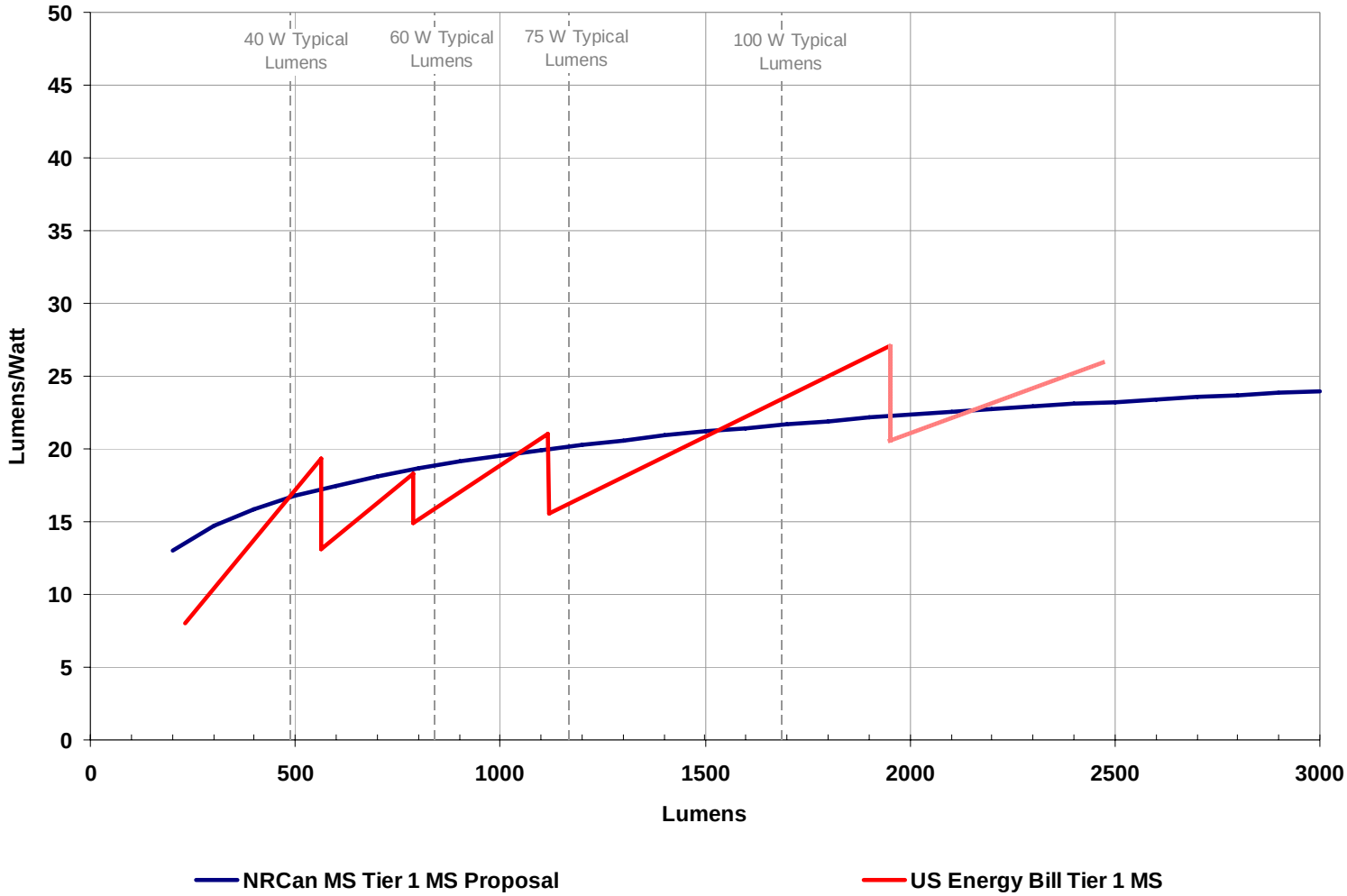


Modified Spectrum Standards



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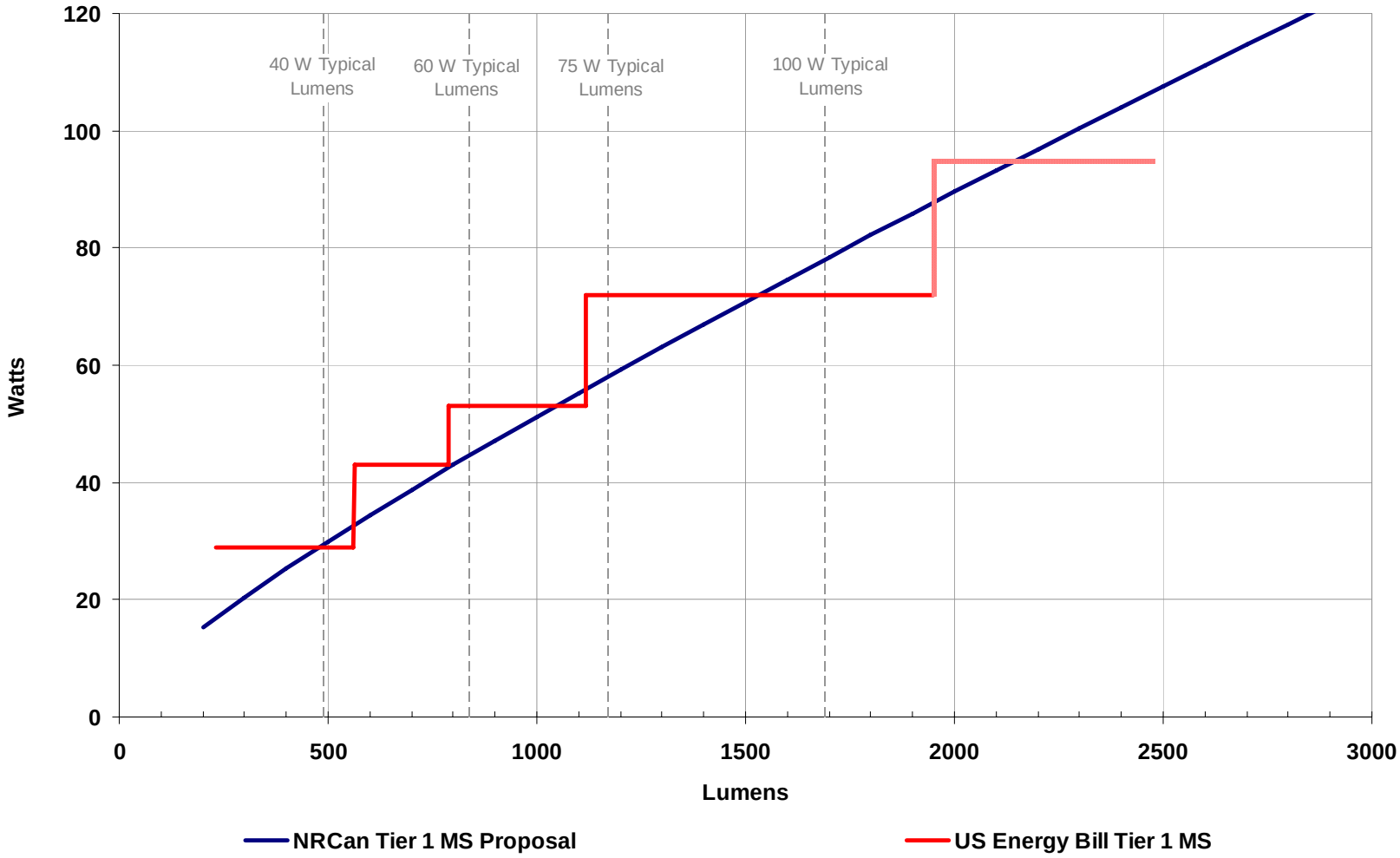


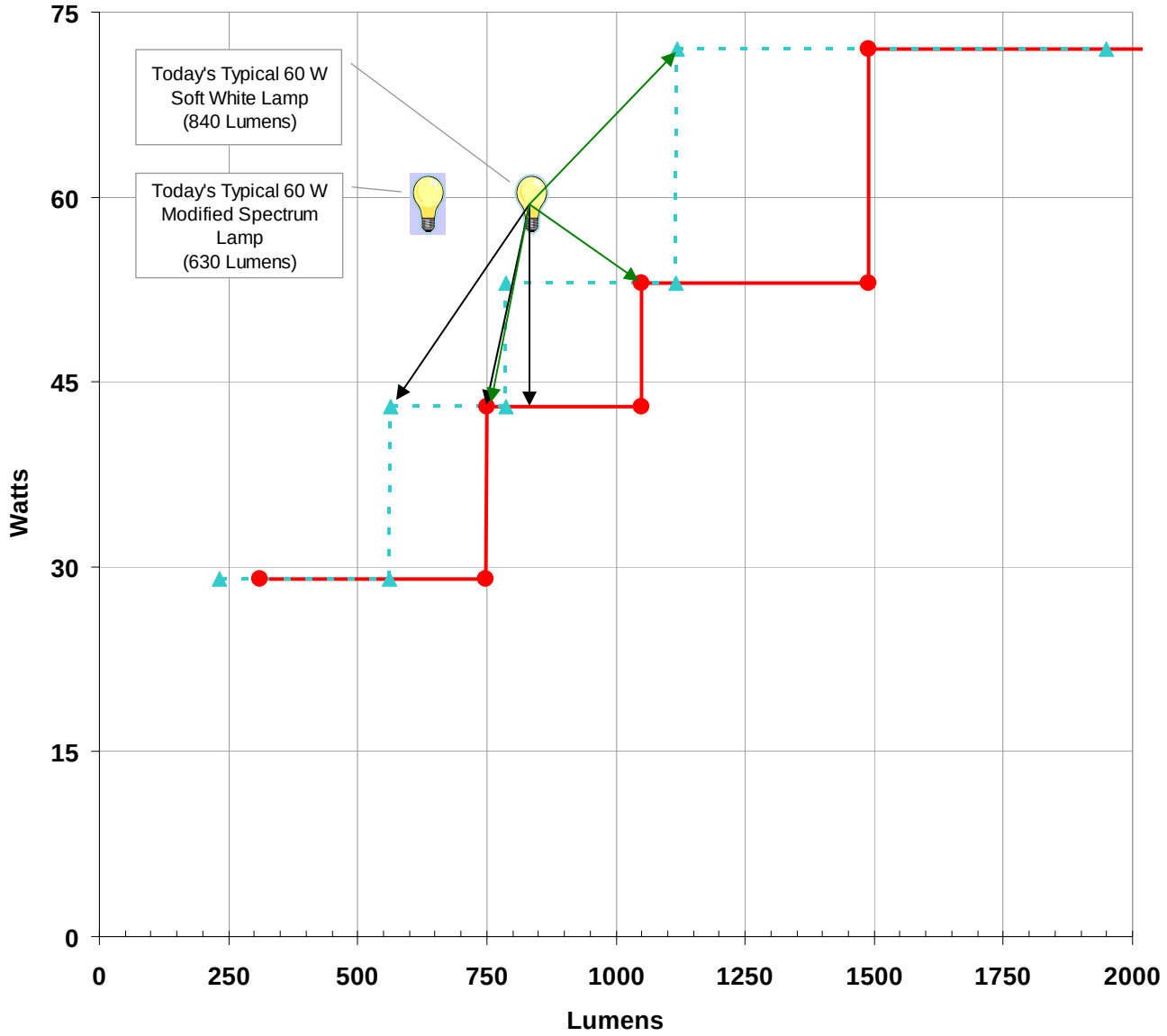
What Will the New Standards Bring?

- At its best, the new federal lighting requirements will lead to the introduction of new bulbs with different and lower wattages than today's. Some consumers will shift to lower incandescent wattages, and most will buy CFLs instead.
- At its worst, the new federal lighting requirements will cause one or more manufacturers to shift their current incandescent business wholly to modified spectrum lamps that are dimmer, less efficient, and longer lasting than the standard bulbs they sell today, and cheaper than the efficient products their competitors are offering. Customers will also buy 3-way and vibration service bulbs for general service applications to get the familiar lamps they're used to, until DOE regulates them.

EISA Impacts, Continued

- The most likely outcome is, of course, somewhere in the middle:
  - CFL sales will continue to rise, and LEDs will start gaining market share as well, beginning with the lowest lumen products.
  - Modified spectrum lamps will sell in larger numbers than conventional incandescents and continue to be dimmer.
  - A large fraction of incandescent buyers will switch to the wattage bin immediately below or above the one they currently buy, rather than the one recommended by the wording on the package.

Wattage Plateaus vs. Purchase Decisions



Desired Outcome: Lower Power, Equivalent Performance – Actual Outcome May Be Different

	Today's Standard Incandescent Lamps			
	40 W	60 W	75 W	100 W
Federal Standards Wattage	29 W	43 W	53 W	72 W
Wattage Savings	11 W	17 W	22 W	28 W
% Wattage Savings	27.5%	28.3%	29.3%	28.0%
Efficiency Change (no dimming)	+37.9%	+39.5%	+41.4%	+38.9%
% Dimming Allowed for Standard Lamps	-39.2%	-10.7%	-10.3%	-12.9%
Efficiency Change (full dimming)	-16.1%	+24.3%	+26.9%	+21.1%
% Dimming Allowed for Modified Spectrum Lamps	-54.5%	-33.0%	-32.6%	-34.6%
Efficiency Change (full dimming to modified spectrum levels)	-24.4%	-6.6%	-4.7%	-9.2%

Which Factors Are Driving Up Residential Lighting Energy Use?

- Population growth
- Fewer people per household (yielding more total dwellings and lamps per person)
- Increasing home square footage
- Higher ceilings (lighting levels diminish by the square of the distance traveled)
- Aging population
- Increasing sales of long life and modified spectrum incandescents with lower average efficiencies
- Title 24 standards that discourage use of CFLs
- Inconsistent enforcement of Title 20 standards

Which Factors Are Reducing Residential Lighting Energy Use?

- Declining price and increasing availability of CFLs
- Testing programs that ensure good performance of labeled CFLs
- Increasing prevalence of ENERGY STAR fixtures in new construction
- Rising energy prices that encourage conservation (shutting off lights in unoccupied rooms)
- Increasing utilization of dimming and occupancy sensing controls
- Title 24 and Title 20 efficiency requirements

How Will Residential Lighting Energy Use Change by 2018 from EISA alone if the CEC Takes No Further Action? (Low Efficiency Scenario)

- Average lamp wattage will drop by about 24%:
  - Unregulated lamps promoted by mfrs and retailers; standards enforcement is poor
  - Most new incandescents introduced at dim end of bins
  - Modified spectrum lamp sales steadily rise
  - Many consumers jump up a bin to get enough light
  - CFL socket share rises to 25%
  - LED technology improves steadily; gains 5% socket share
- Average energy use per household will drop about 9 to 19%, depending on changes in average hours of operation
- 14% expected growth in the number of households will wipe out those gains, yielding roughly constant total residential lighting energy consumption.

What Is Possible by 2018 in an Efficient Scenario?

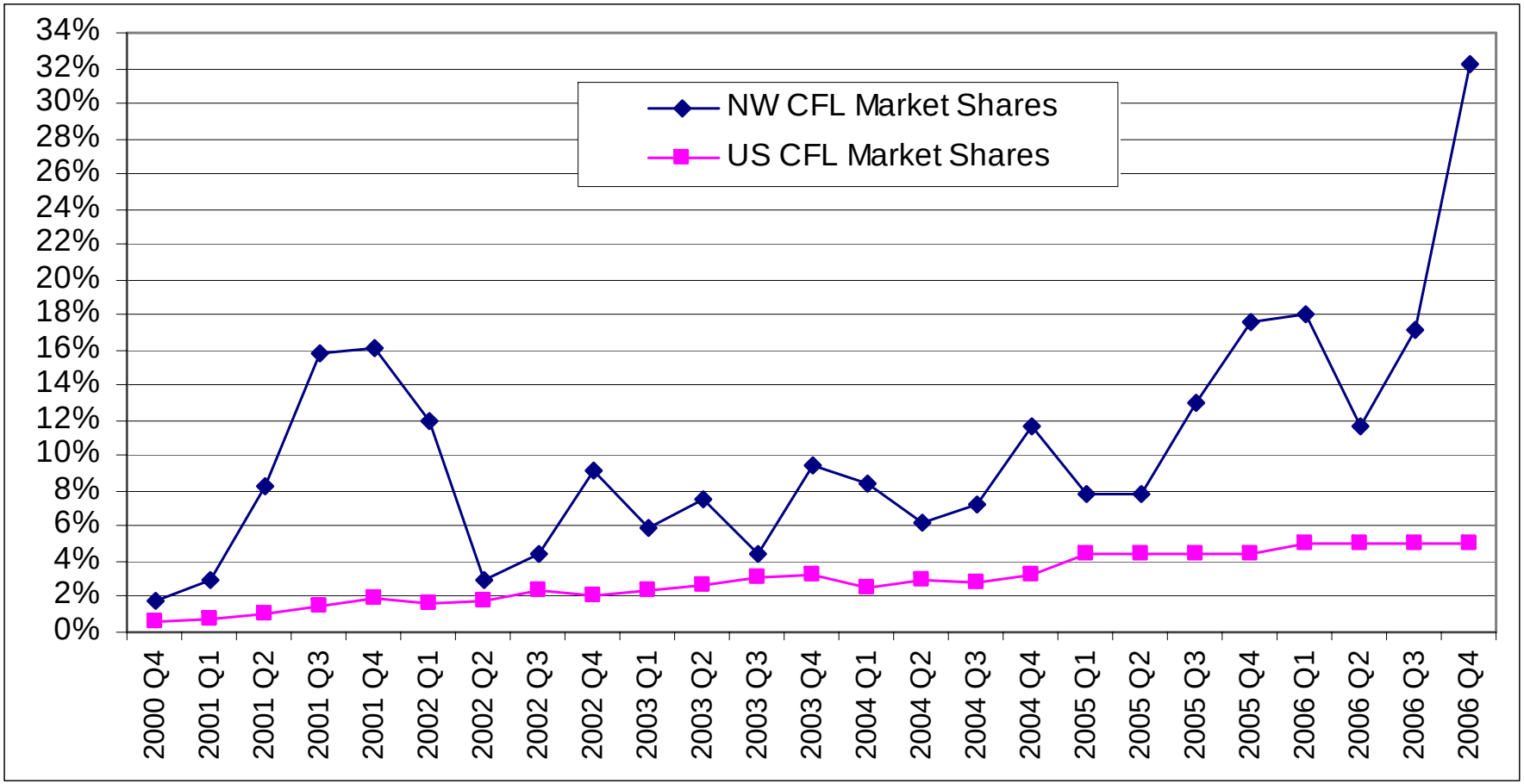
- Average lamp wattage drops by 41%:
  - Only 5% of incandescents sold are unregulated; adequate enforcement
  - Most new incandescents improve efficiency without reducing light output
  - Modified spectrum sales only rise slowly
  - Effective consumer education and better light bulbs reduce bin-jumping
  - CFL socket share rises to 40%
  - LED efficiency improves and socket share grows to 15%
- Average energy use per household will drop by 28 to 38%, depending on hours of operation
- Total statewide residential lighting electricity use drops about 24%

What Is Possible by 2018 in a (Highly Unlikely) Best Case Scenario

- Average lamp wattage drops by 57%:
  - Virtually no sales of unregulated lamps; aggressive standards enforcement
  - Nearly all new incandescents improve efficiency with no loss of light output and cut power an additional 10% after 2014
  - Modified spectrum sales remain flat
  - No bin-jumping: only demographics increase demand for higher lighting levels
  - CFLs capture 45% socket share and use 10% less power
  - LEDs capture 22% socket share and use 50% less power
- Average energy use per household drops about 50 to 54%, depending on hours of operation

  Total statewide residential lighting energy use drops about 43 to 48%

High CFL Sales Occur in Areas with Sustained Product Promotion like the Northwest and California



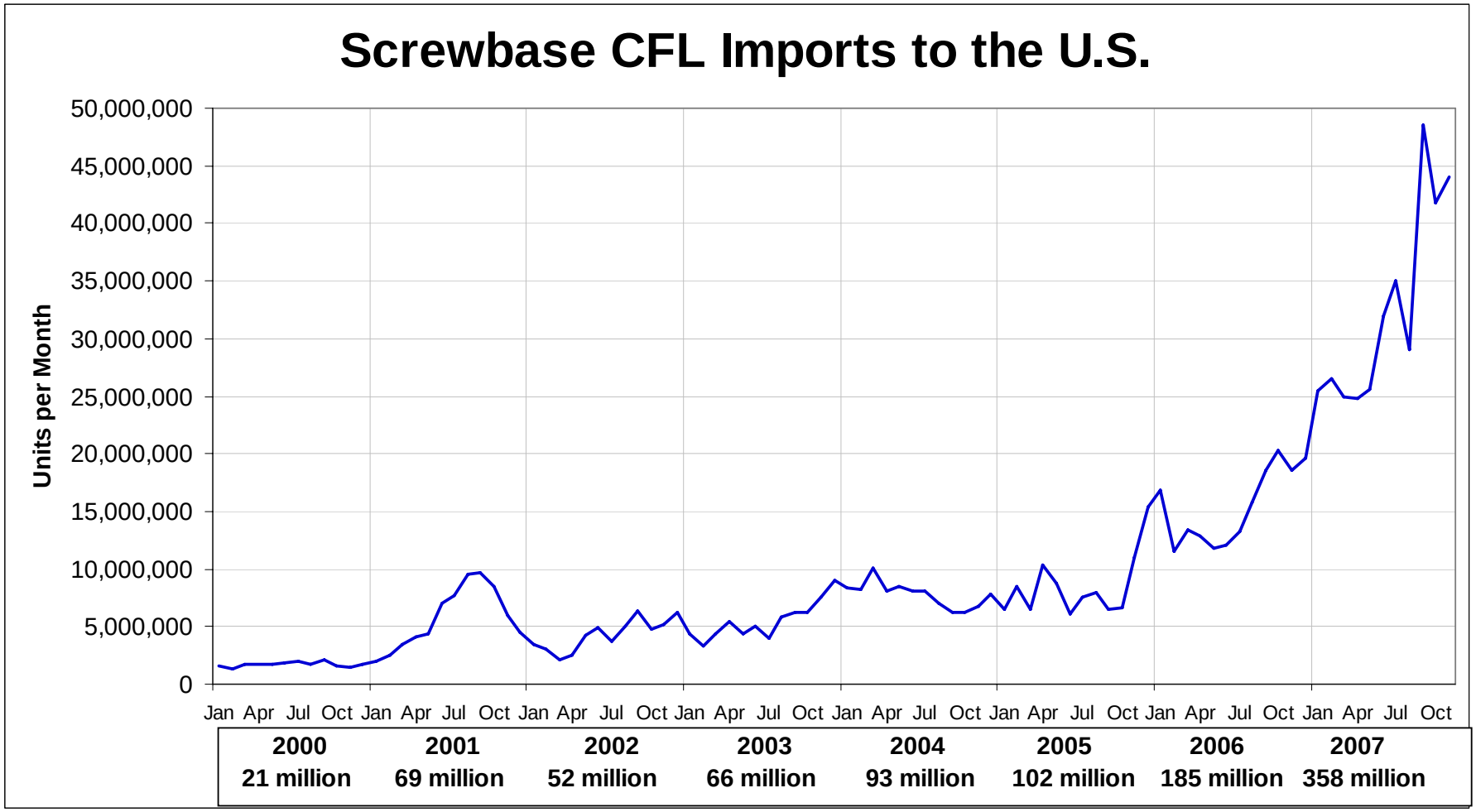
Sources: NW CFL sales 2000-2006: PECI and Fluid Market Strategies sales data reports; and NEEA estimate of an additional 1.5 million WAL-MART CFLs sold region-wide in 2006 (See Appendix A [Section 9.1.1] of MPER3 for more detail); U.S. and NW population estimates 2000-2006: U.S. Census 2004; U.S. market shares and non-CFL sales 2000-2005: Itron California Lamp Report (2006); U.S. market share 2006: D&R International (personal communication).

ESOURCE CFL Market Research Findings

- Surveyed 115,000 consumers in Q1 2007
- Found national average of 3.4 CFLs per household: less than 3 in many Southeast and Midwest states, 4.6 in CA, >6 in VT
- Half of households had no CFLs, meaning the households with CFLs averaged 6-7 each. Marketing has done a better job motivating current users to buy more CFLs than encouraging new users to try them.
- CFL purchase rates rise with age and income; men more likely to buy than women
- Long life and financial savings on energy and replacement bulbs a greater motivator than environmental benefits and utility rebates

Source: Bill LeBlanc, ESOURCE, 2007

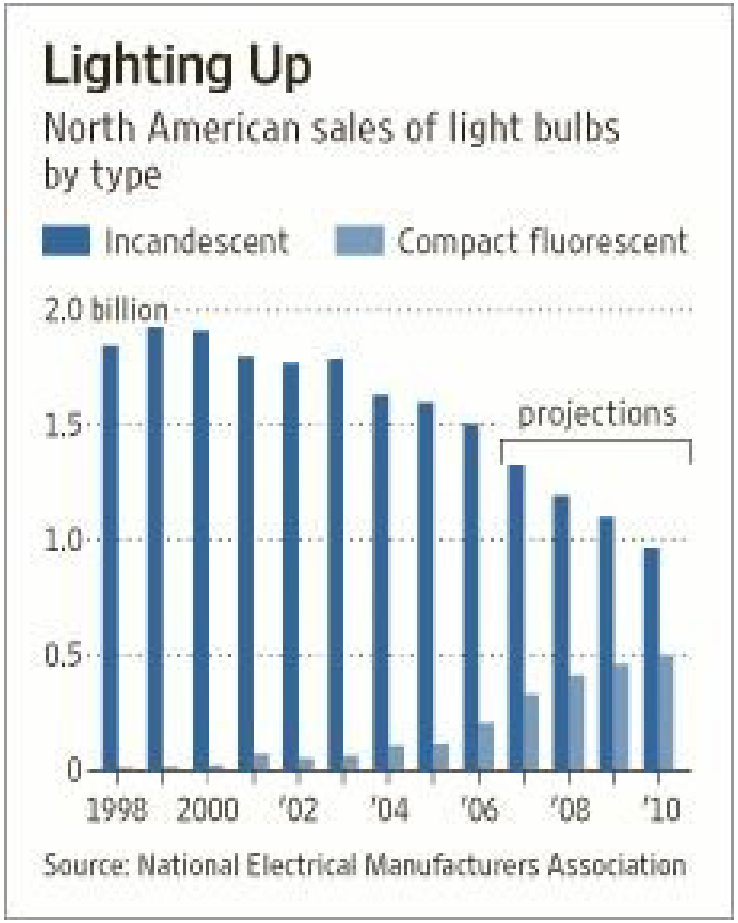
More CFLs Were Sold in the U.S. in 2007 than in 2004, 2005, and 2006 Combined



Source: U.S. Dept. of Commerce trade statistics. 2007 data include only Jan-Nov; full year total will likely exceed 400 million units.

Big Picture Estimates for CFL Market Share

- In 2007, CFLs were about 33% of screw-based bulbs *imported* into the U.S.
- 2007 CFL share of unit *sales* is more difficult to estimate: roughly 25%
- California represented 9.6% of ENERGY STAR CFLs sold by major retailers in Q1 2007 (less than its per-capita share)
- CFL national socket share was about 10% in early 2007
- California CFL socket share is closer to 15%



Source: *Wall Street Journal*, 2007

Recommendations

- Enhance enforcement of existing standards
- Pursue Title 20 standards for residential lamp and fixture types not pre-empted by EISA
- Plan to accelerate adoption of EISA in California as soon as the law allows
- Use Title 24 standards to require greater use of efficient fixtures, avoid penalizing the use of CFLs, and encourage better controls
- Consider financial disincentives on the continued sale of the least efficient incandescents
- Consider incentives for super-CFLs and best-in-class LED products